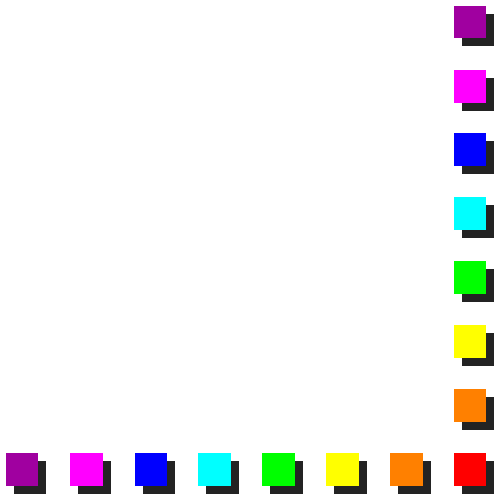
Cisco Lab@Politecnico di Torino

Fulvio Risso

http://staff.polito.it/fulvio.risso/



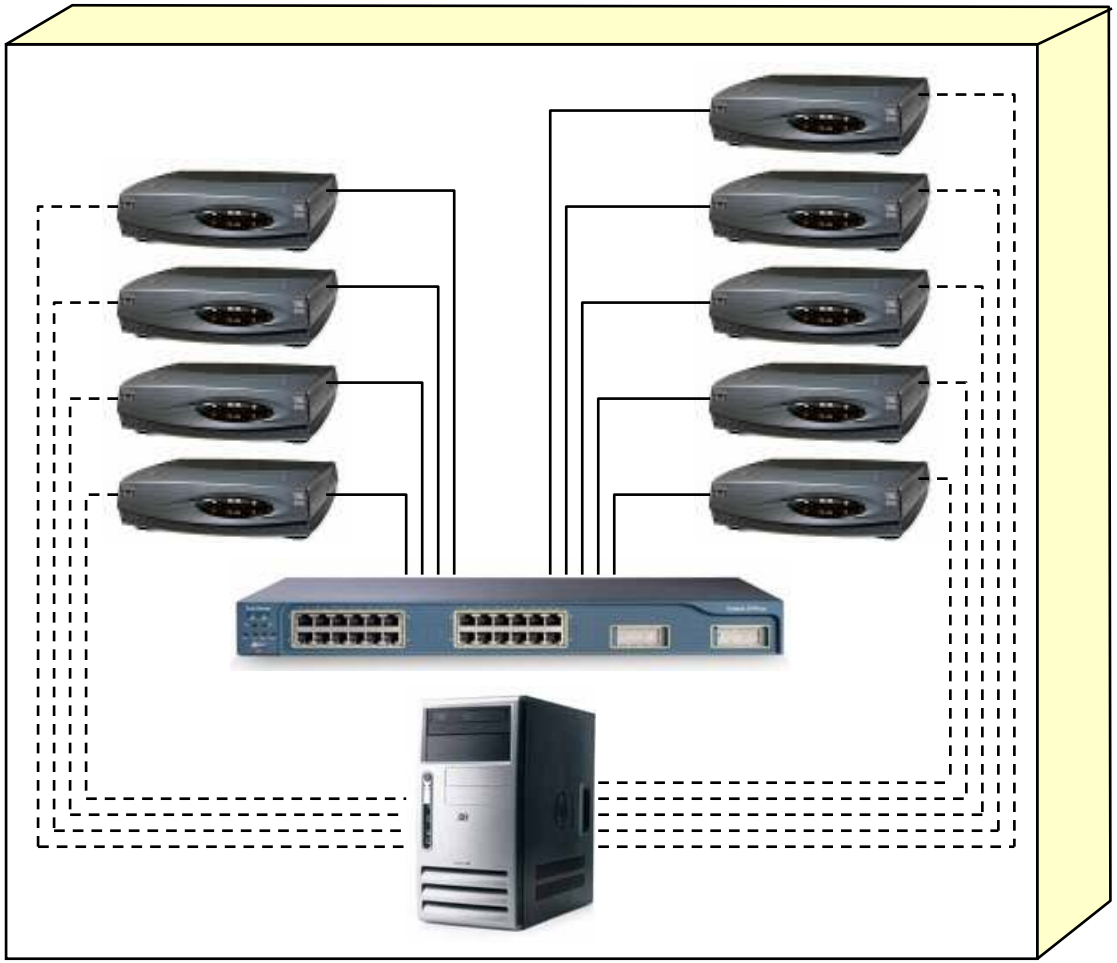
Main objectives

- **Main use: teaching**
  - So, features, not performances
- **Not experimental devices, but what students will use in their work life**
  - Students are happier
  - Total cost of ownership (install/restore)
  - Simpler CLI (compared to using several LInux daemons)
  - More features
  - Smaller (and less power hungry)
  - Not very expensive
- **Easier to manage**
  - Everyday use (student accounts)
  - Re-configuration (e.g. Different logical topologies)
  - Easy to restore (e.g., in case the OS is deleted from FLASH)
- **Possibility to generate and capture network traffic**

Why is the lab remote?

- **H24 availability**
  - We can use it also in courses with large number of students
- **To control the lab better**
  - Student do no have physical access
    - E.g. they cannot break a cable

Sructure of the lab



Characteristics

- 9 routers, controlled by a single PC
- Remote access o the “master” server
- Possibility to change the logical topology by reconfiguring the intermediate switch

How the lab looks like

General view

Routers details

Physical devices

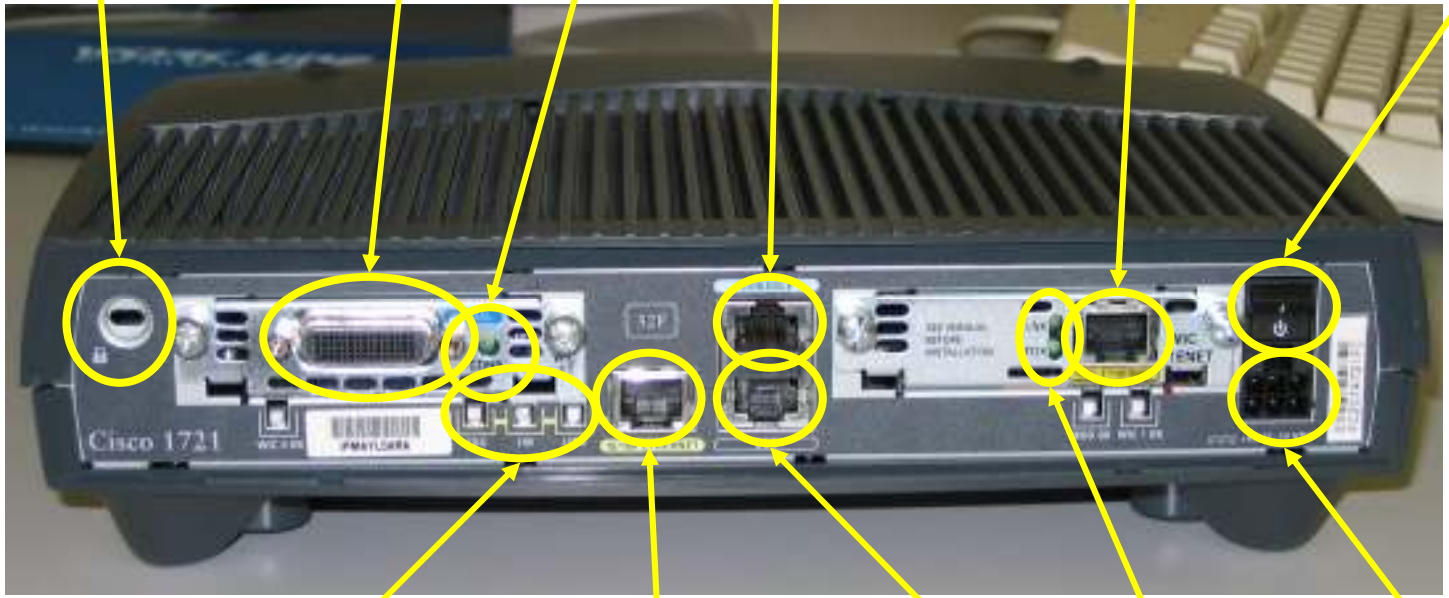
- **Router: Cisco 1700 / Cisco 870**
  - Entry-level
    - Low cost, but it maintains all the features of the high-end devices (although it is slower)
  - Maximum size for FLASH and RAM
  - "Switched" ports (can be user either as a router, or as a switch)

- **Switch: Cisco 2950**
  - Reconfigurable L2 switch, VLAN, 2 GE ports (for sniffing)

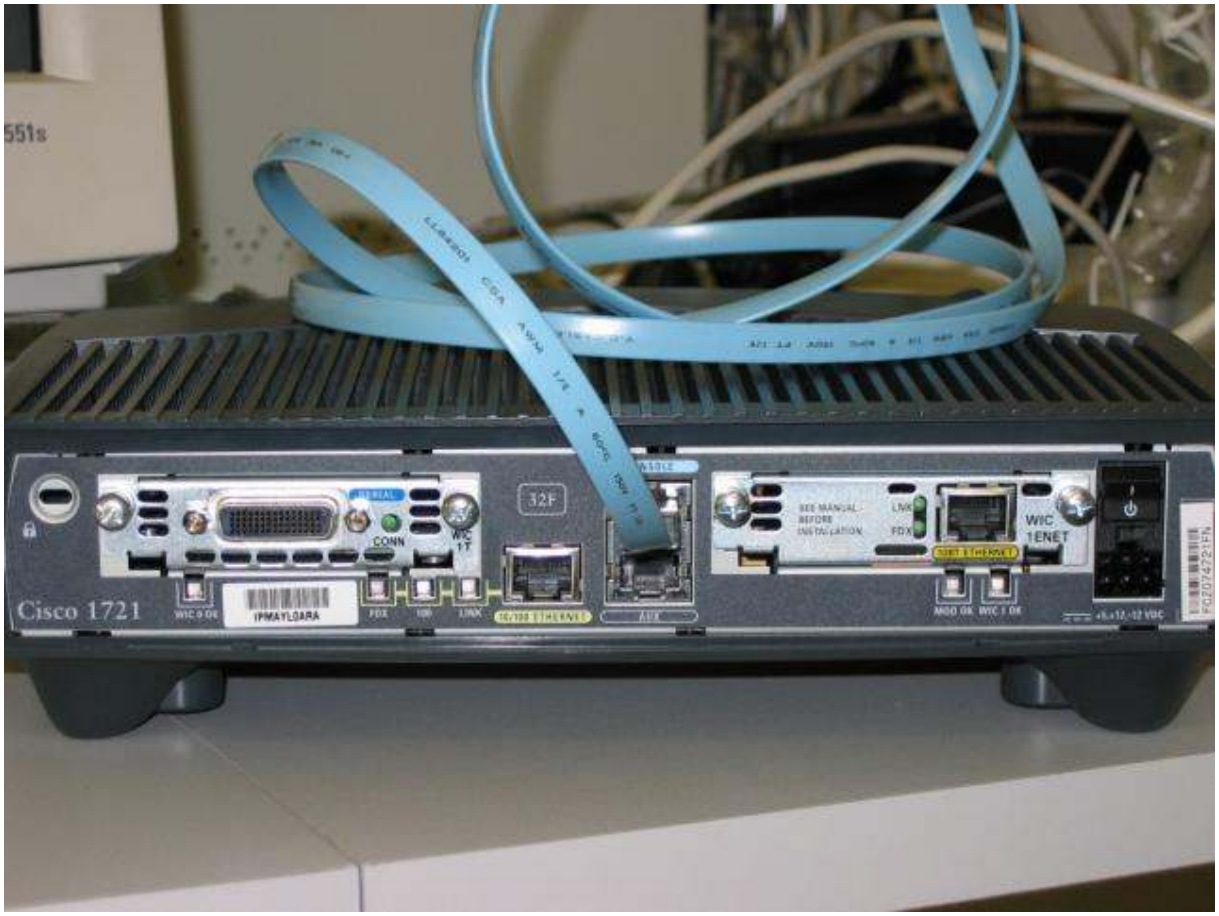
- **Server: standard PC, Windows 2003 Server**
  - Pentium 4HT, 3.0GHz, 1GB RAM, 40GB HD
  - Windows 2003
    - RDP is currently the best solution for remote desktop
  - Multi-serial card

- **Total cost**
  - About 15K€

Rear view of a router: Cisco 1721

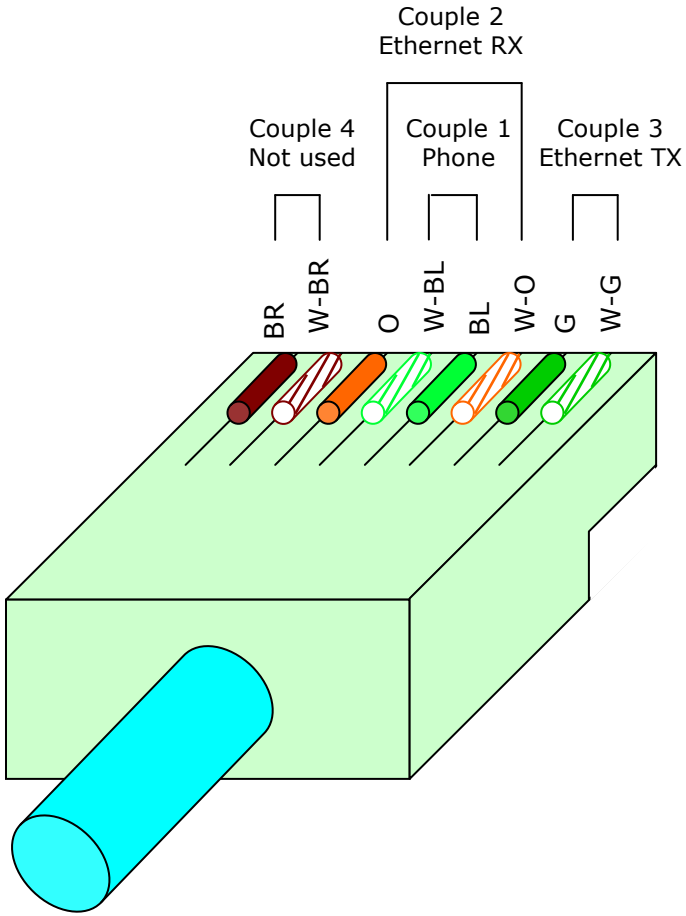


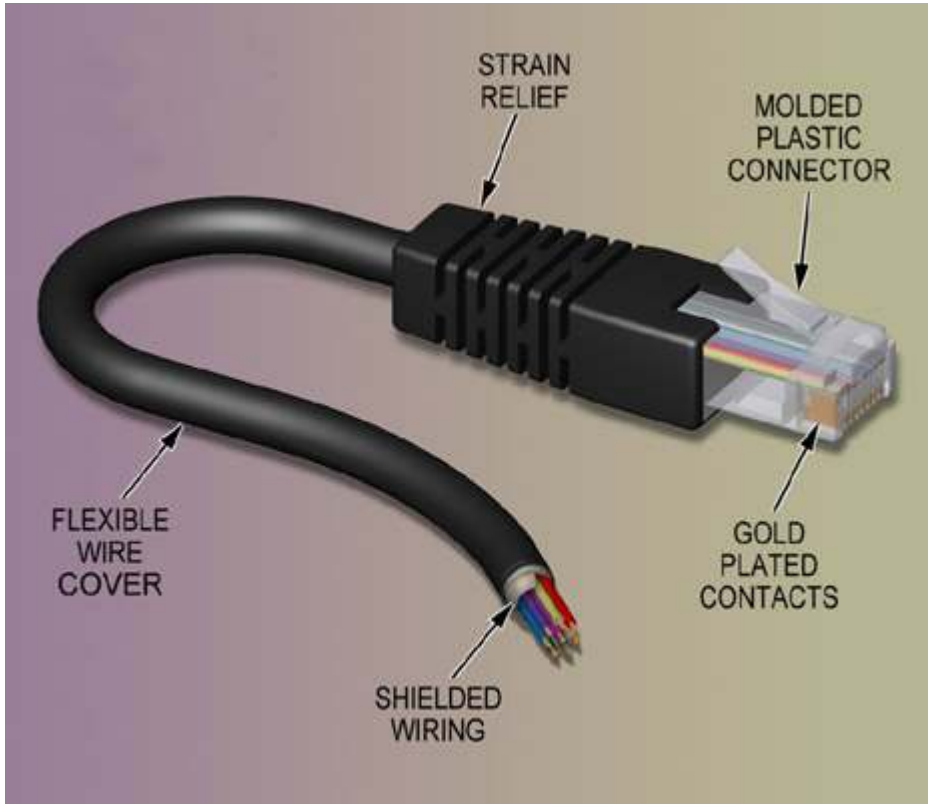
Connection between devices: console



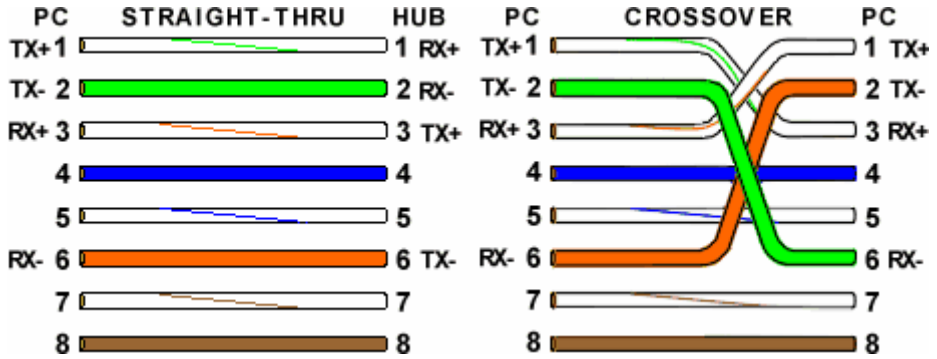
Console cable: usually RJ45 on one site, DB9 on the other side
(often made with a straight Ethernet cable with one adapter on one side)

Ethernet cables (1)





Ethernet cables (2)

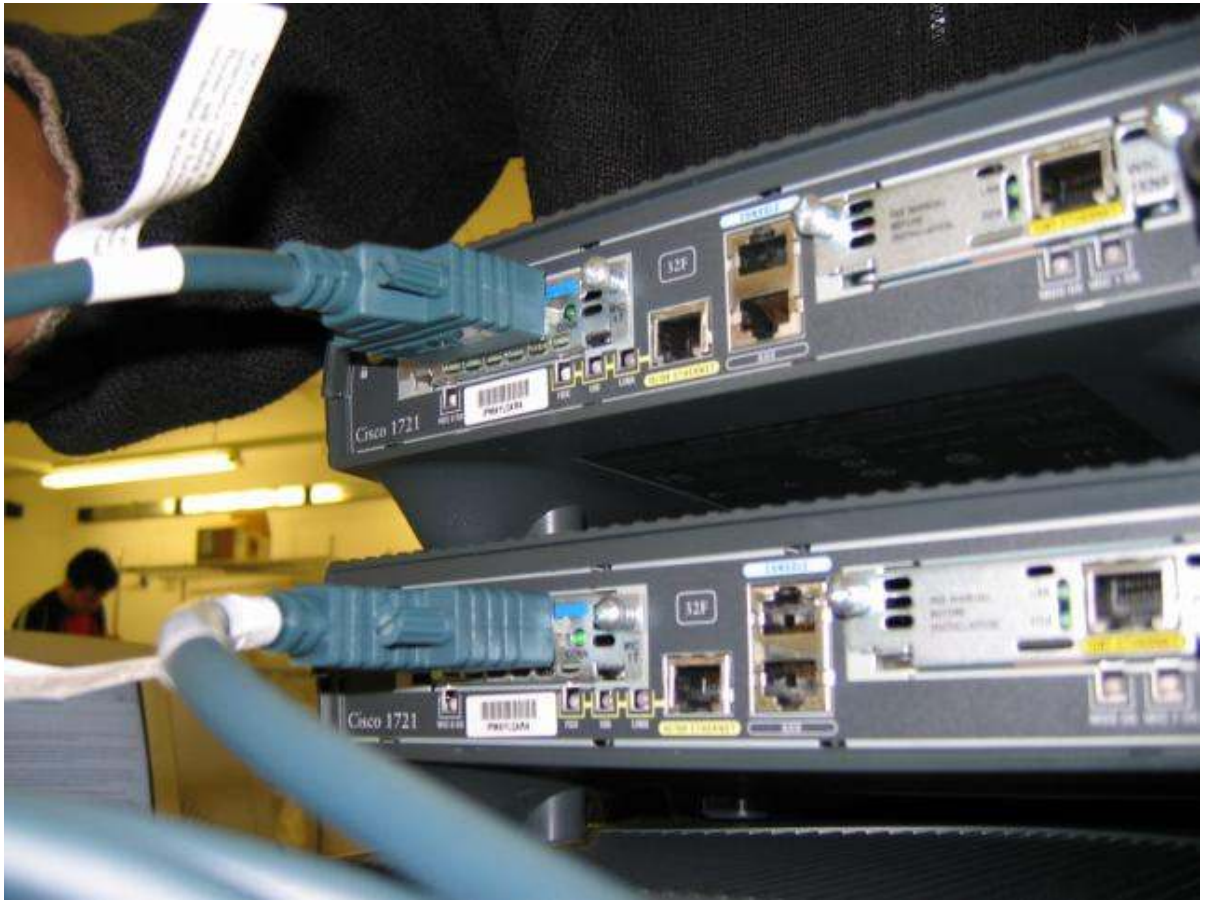


Ethernet/FastEthernet cable

GigabitEthernet cable

Pin	Straight-thru		Crossover	
	Color	Signal	Color	Signal
1	W-G	TRD0+	W-O	TRD1+
2	G	TRD0-	BL	TRD1-
3	W-O	TRD1+	W-G	TRD0+
4	BL	TRD2+	W-BR	TRD3+
5	W-BL	TRD2-	BR	TRD3-
6	BL	TRD1-	G	TRD0-
7	W-BR	TRD3+	BL	TRD2+
8	BR	TRD3-	W-BL	TRD2-

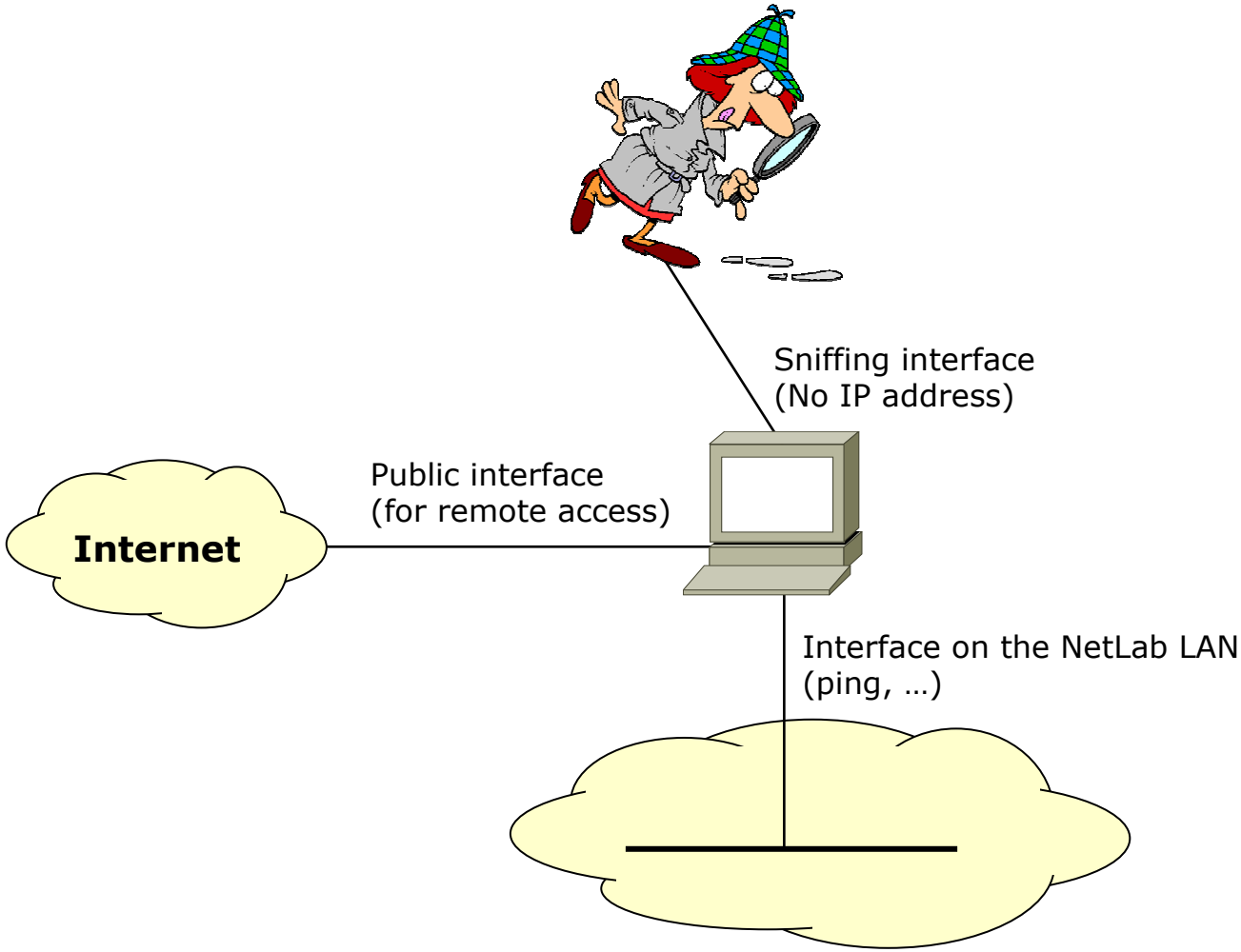
DTE/DCE cables



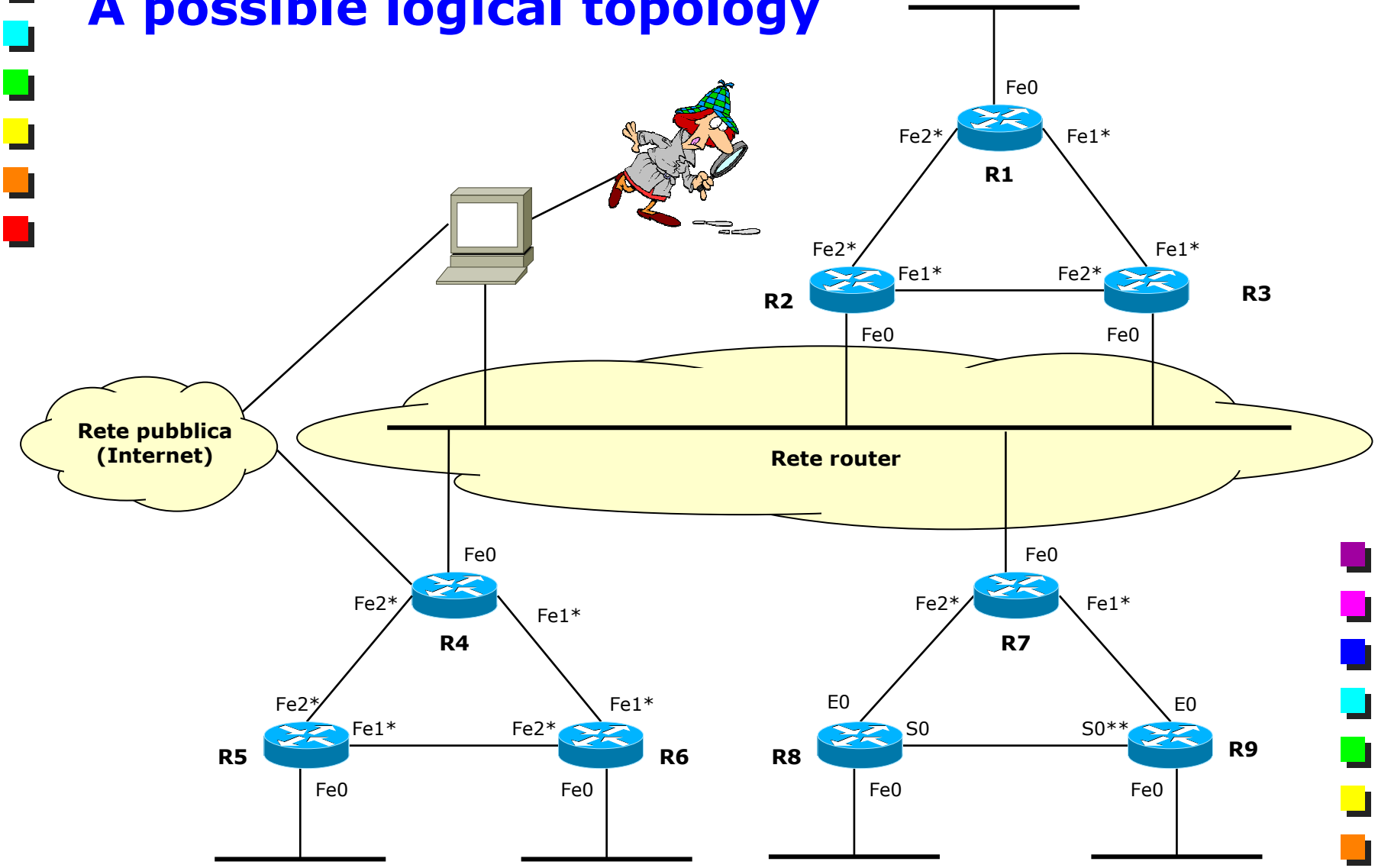
DCE/DTE: usually connected to a geographical modem (e.g. HDSL)
Lab: connected back-to-back (required to set the interface speed on the DCE)

Multiserial card

The Netlab server



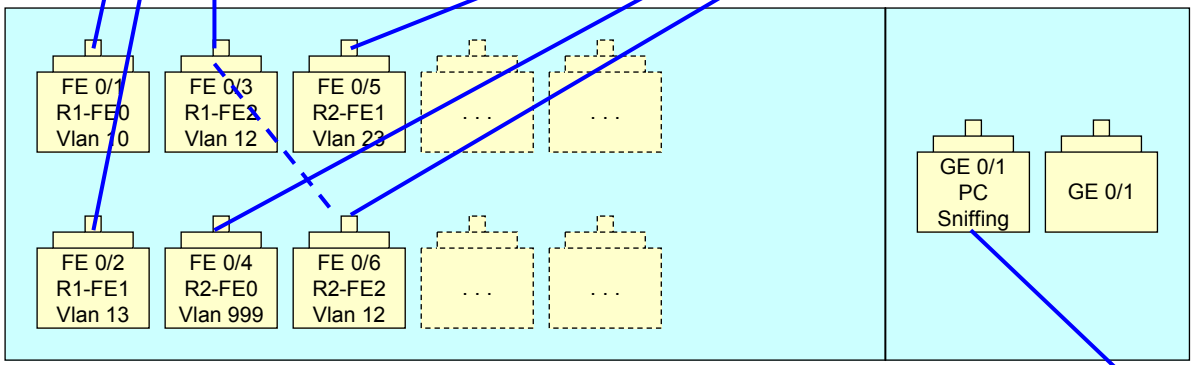
A possible logical topology



Physical topology

R1: Cisco 1711VPN/K9

R2: Cisco 1711VPN/K9

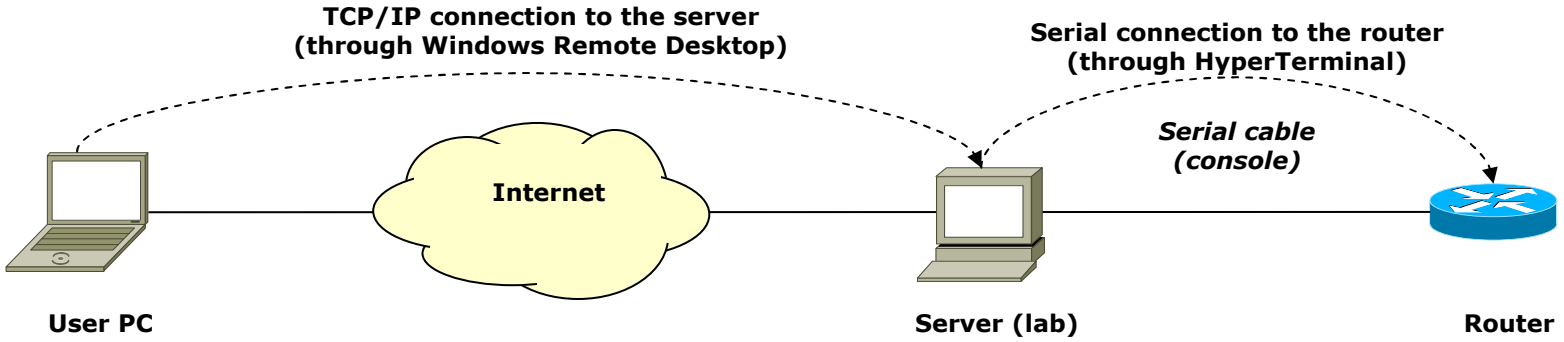


Cisco Catalyst 2950T-48 SI

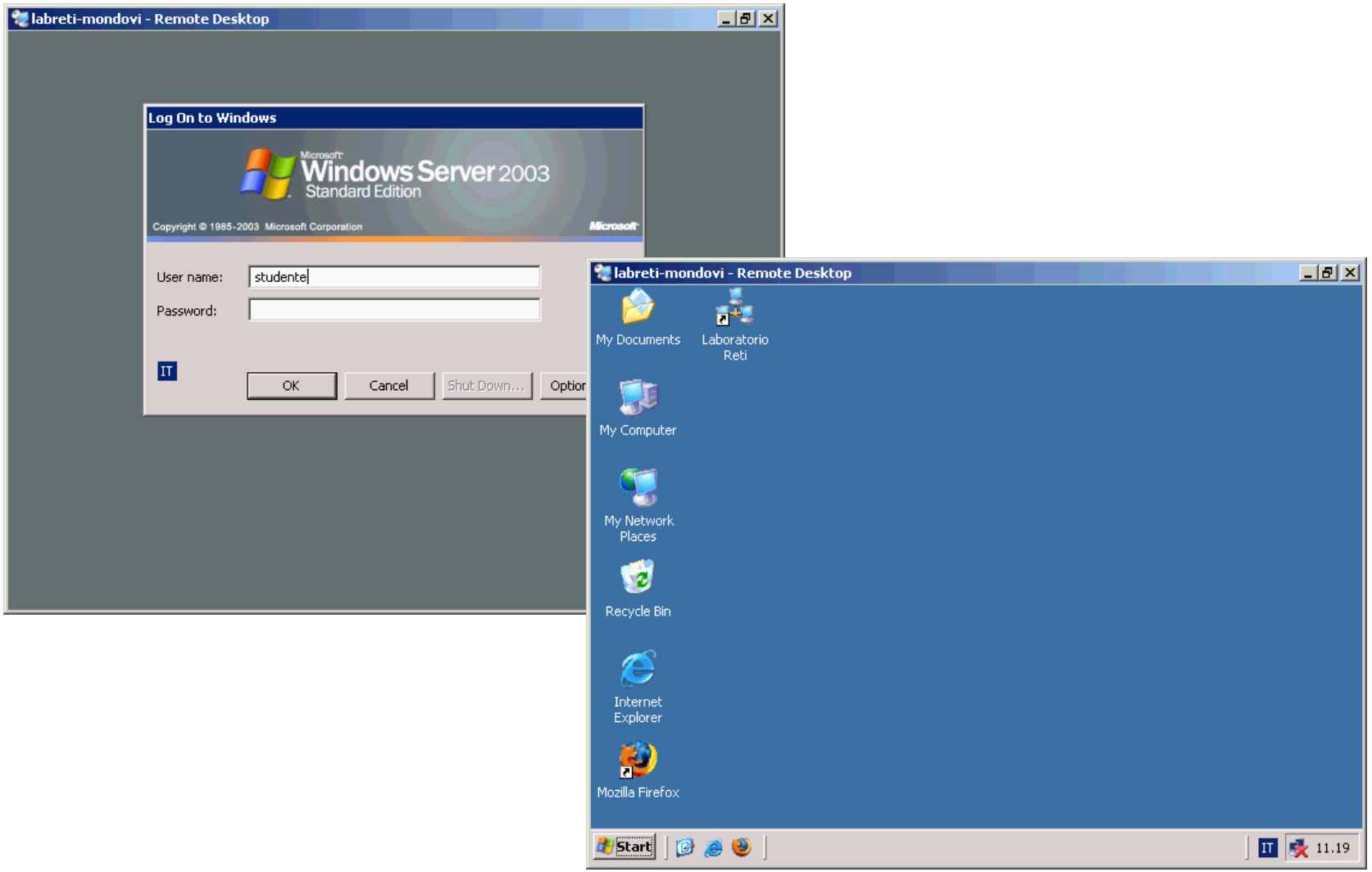
HP dc5100

Access to the remote lab (1)

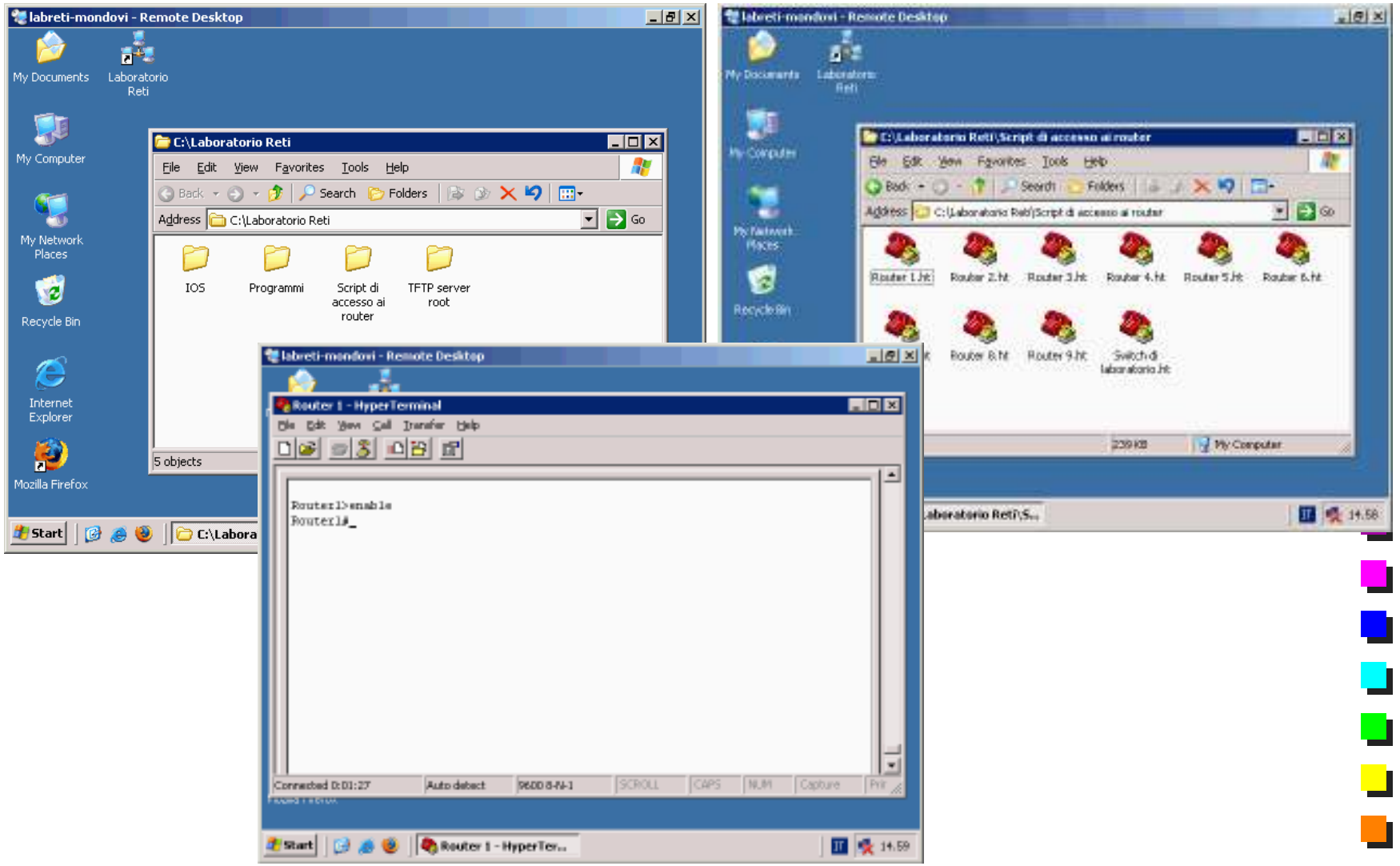
- **Physical address of the Windows 2003 servers**
  - Labreti-mondovi.ipv6.polito.it
  - Labreti-torino.ipv6.polito.it
- **Remote Desktop**
  - Windows XP/Vista: Use Remote Desktop Connection
  - UNIX: use *rdesktop*



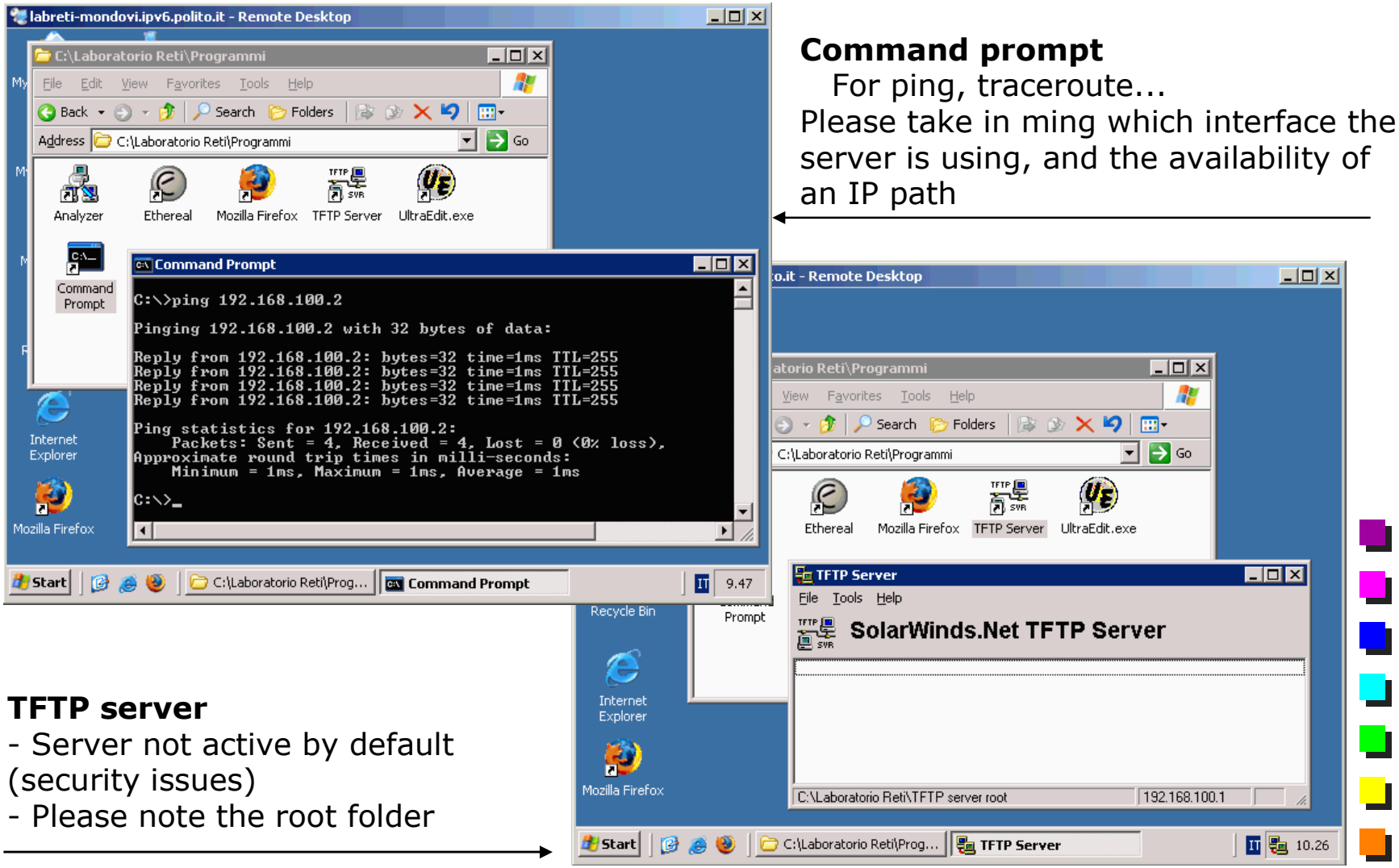
Access to the remote lab (2)



Access to the remote lab (3)



Available apps (1)



Command prompt

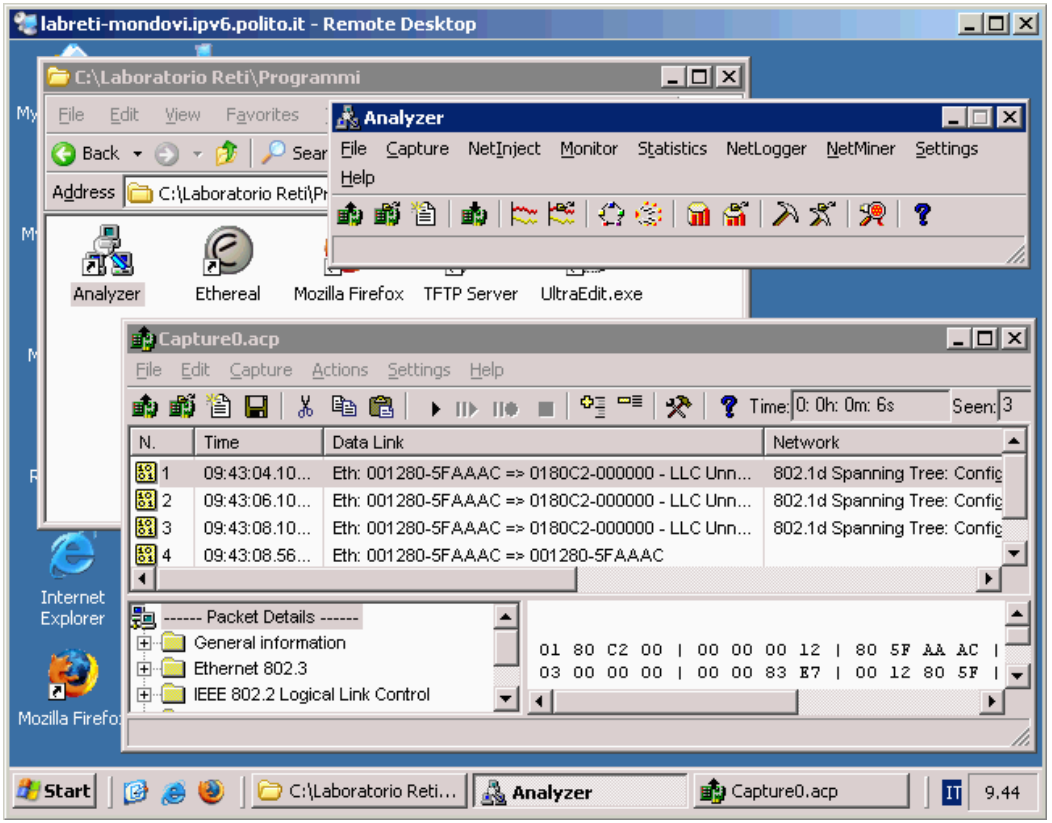
For ping, traceroute...

Please take in ming which interface the server is using, and the availability of an IP path

TFTP server

- Server not active by default (security issues)
- Please note the root folder

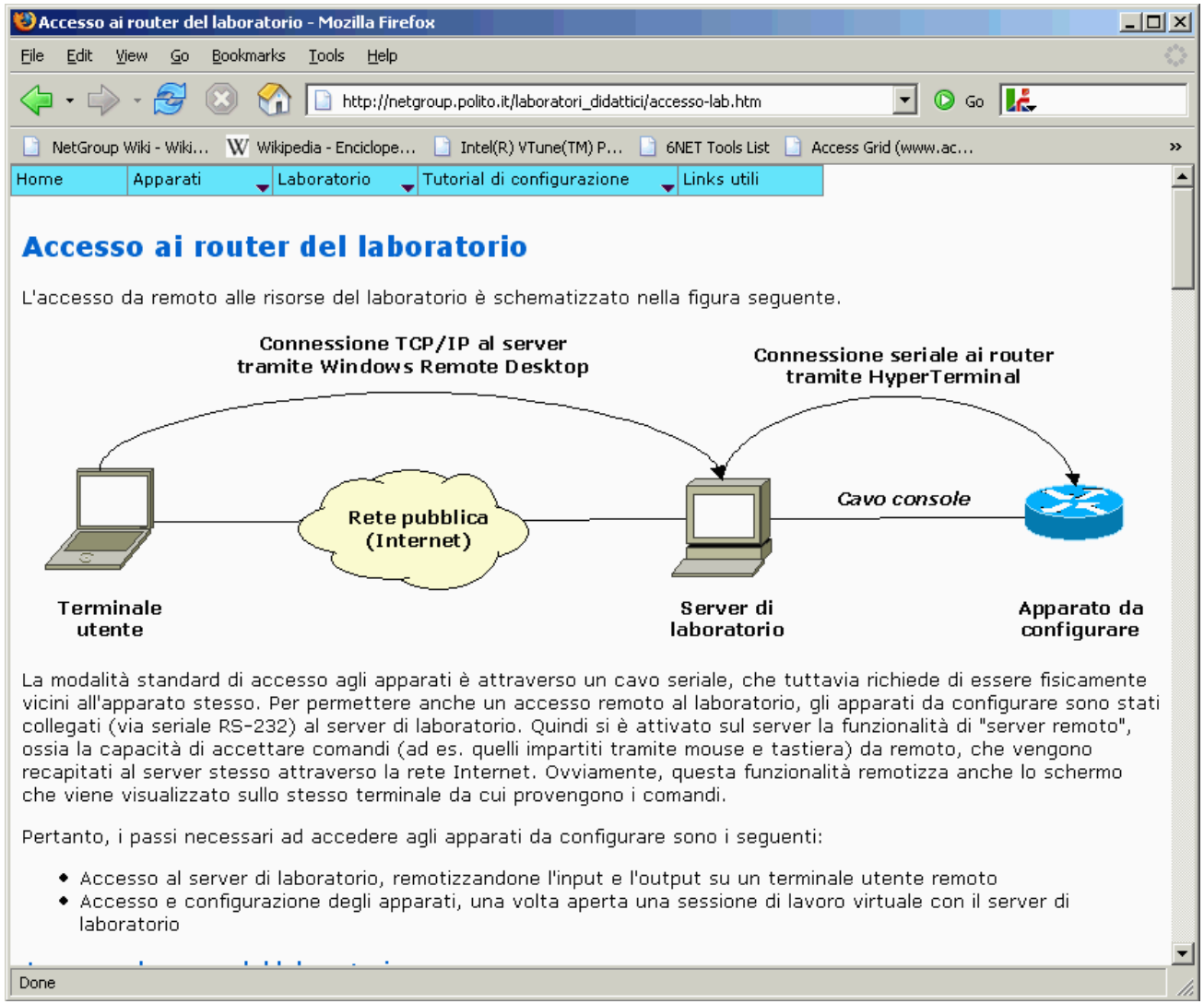
Available apps (2)


labreti-mondovi.ipv6.polito.it - Remote Desktop
C:\Laboratorio Reti\Programmi
File Edit View Favorites
Back
Address C:\Laboratorio Reti\Pr
Analyzer
File Capture NetInject Monitor Statistics NetLogger NetMiner Settings
Help
Analyzer
Ethereal
Mozilla Firefox
TFTP Server
UltraEdit.exe
Capture0.acp
File Edit Capture Actions Settings Help
Time: 0: 0h: 0m: 6s
Seen: 3
N. Time Data Link Network
1 09:43:04.10... Eth: 001280-5FAAAC => 0180C2-000000 - LLC Unn... 802.1d Spanning Tree: Confic
2 09:43:06.10... Eth: 001280-5FAAAC => 0180C2-000000 - LLC Unn... 802.1d Spanning Tree: Confic
3 09:43:08.10... Eth: 001280-5FAAAC => 0180C2-000000 - LLC Unn... 802.1d Spanning Tree: Confic
4 09:43:08.56... Eth: 001280-5FAAAC => 001280-5FAAAC
Internet Explorer
Mozilla Firefox
------ Packet Details ------
General information
Ethernet 802.3
IEEE 802.2 Logical Link Control
01 80 C2 00 | 00 00 00 12 | 80 5F AA AC |
03 00 00 00 | 00 00 83 E7 | 00 12 80 5F |
Start
C:\Laboratorio Reti...
Analyzer
Capture0.acp
IT
9.44

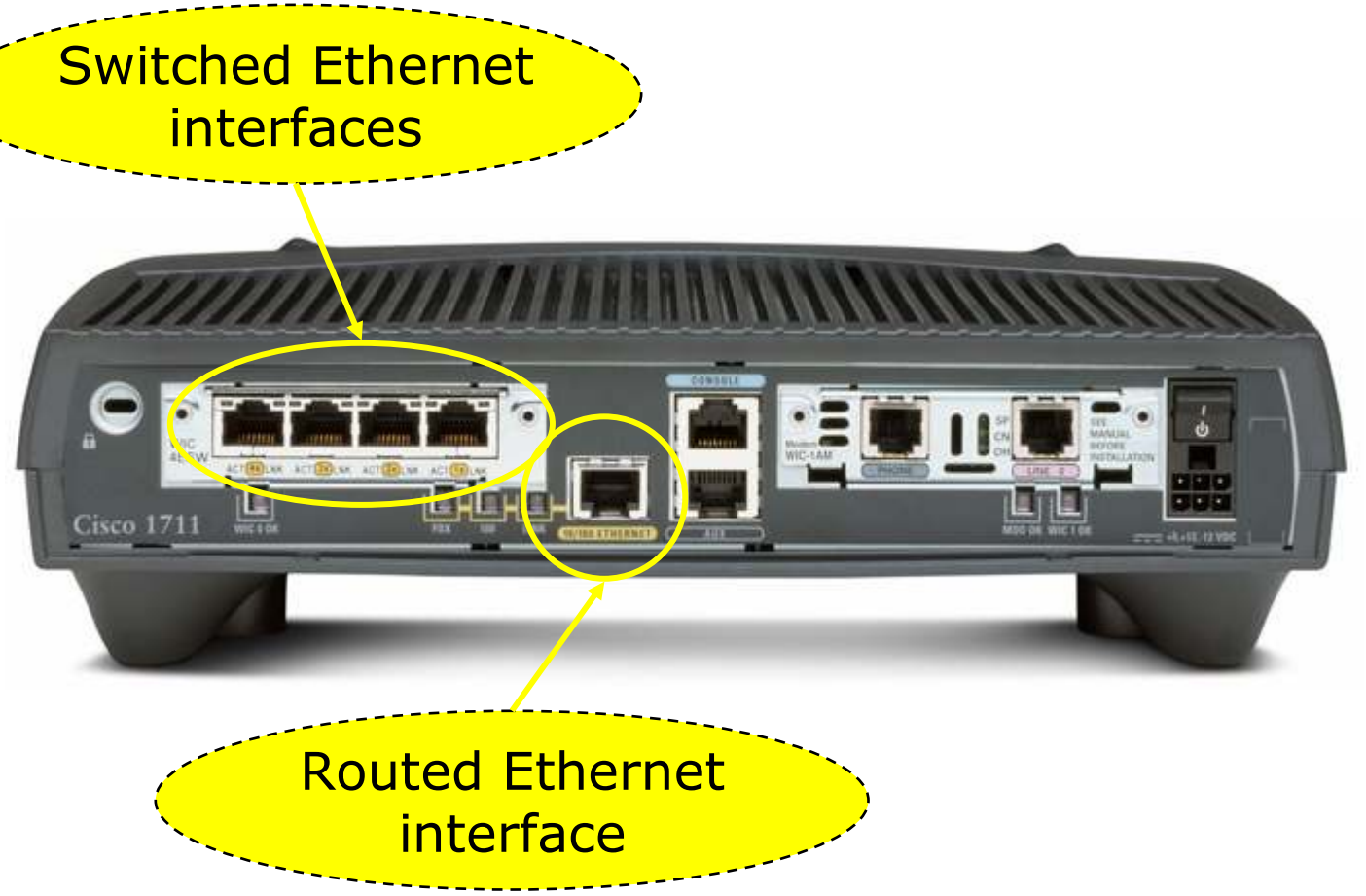
Interfaces:

- Sniffing interface (passive interface, sniffing only)
  - Captures traffic flowing on *all* the other interfaces (except serial links)
  - Captures all traffic (so, please set the proper filter)
- Interface toward routers backbone LAN (active interface)

Online website


Accesso ai router del laboratorio - Mozilla Firefox
File Edit View Go Bookmarks Tools Help
http://netgroup.polito.it/laboratori_didattici/accesso-lab.htm
Go
NetGroup Wiki - Wiki...
Wikipedia - Enciclope...
Intel(R) VTune(TM) P...
6NET Tools List
Access Grid (www.ac...
Home
Apparati
Laboratorio
Tutorial di configurazione
Links utili
Accesso ai router del laboratorio
L'accesso da remoto alle risorse del laboratorio è schematizzato nella figura seguente.
Connessione TCP/IP al server tramite Windows Remote Desktop
Connessione seriale ai router tramite HyperTerminal
Rete pubblica (Internet)
Cavo console
Terminale utente
Server di laboratorio
Apparato da configurare
La modalità standard di accesso agli apparati è attraverso un cavo seriale, che tuttavia richiede di essere fisicamente vicini all'apparato stesso. Per permettere anche un accesso remoto al laboratorio, gli apparati da configurare sono stati collegati (via seriale RS-232) al server di laboratorio. Quindi si è attivato sul server la funzionalità di "server remoto", ossia la capacità di accettare comandi (ad es. quelli impartiti tramite mouse e tastiera) da remoto, che vengono recapitati al server stesso attraverso la rete Internet. Ovviamente, questa funzionalità remotizza anche lo schermo che viene visualizzato sullo stesso terminale da cui provengono i comandi.
Pertanto, i passi necessari ad accedere agli apparati da configurare sono i seguenti:
Accesso al server di laboratorio, remotizzandone l'input e l'output su un terminale utente remoto
Accesso e configurazione degli apparati, una volta aperta una sessione di lavoro virtuale con il server di laboratorio
Done

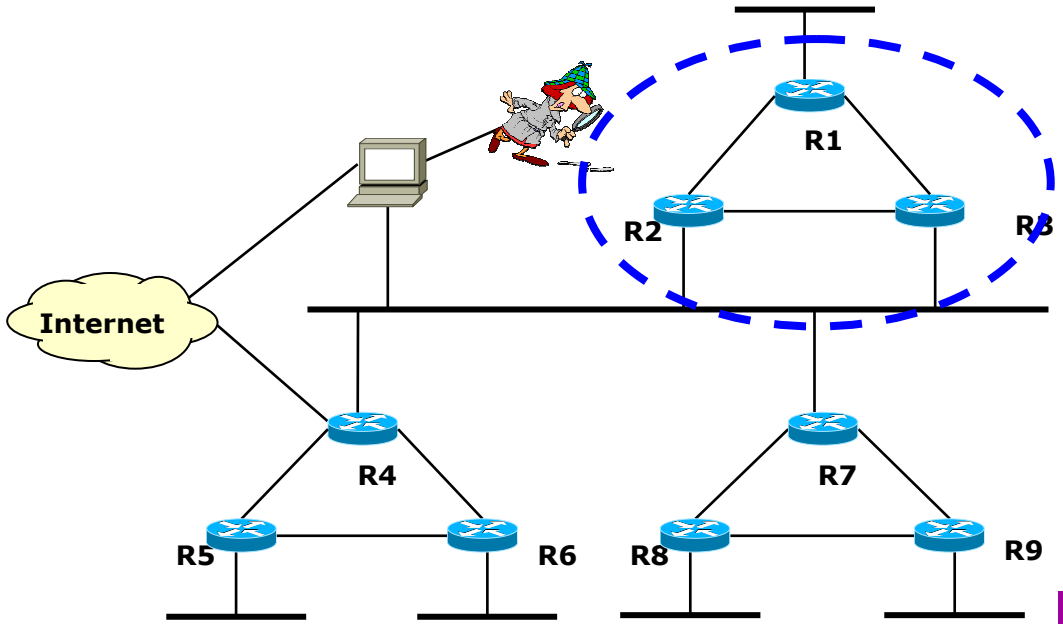
Some tips: switched/routed interfaces



!! Please take care about interfaces marked with "" on the network map!!*

Some tips: Groups and Workplaces

- **Groups**
  - Max 4 students/group
  - Each group has its own password (ask the Assistant for credentials)
  - Please use your workplace (not the entire physical topology)
  - Workplace may vary according to the different assigment



Some tips: logistics

- **Remote Desktop**
  - Log-off explicitely
  - Please do not DISCONNECT or CLOSE
    - **!! Router may be blocked !!**
- **Access to routers**
  - Please refer to the appriate slides
  - !! Remember to inizialize routers before use !!
- **When capturing traffic with Analyzer**
  - Please check that you are using the sniffing interface

Some tips: assistance and lab hours

- **Routers are available H24, assistance is not**
  - A professor will be available only during lab hours for consultancy
  - Lab hours are NOT indended as the sole time for lab exercises
    - In other terms, you have to complete your exercises at home, and come to the lab if you have trouble
    - This is valid only for assigments involving Cisco routers
- **Suggestions:**
  - Do your exercises at home, then come to the lab if you need help
  - In this case, please bring with you all the required material
    - Router configs (time is always missing... So better having configs ready)
    - Valid accounts in order to be able to reproduce the problem on the routers)

Lab and assistance

- **Lab hours can be used as consultancy hours**
- **If you want to get a better use of this time, please do your exercises at home, and if something does not work, please come and ask**
  - You have to try before asking
  - If something does not work, please come with your configuration scripts ready

Some tips: troubleshooting

- **Routers are real devices so, you may expect…**
  - Strange behaviours
  - Cable not working
  - Need to reboot the device
- **If your target destination does not reply to your pings…**
  - Is your local interface up? (interface + line)
  - Is there a route to the remote destination?
  - Is your interface replying to a local “ping”?
  - Is the interface on the other side of the link replying to a “ping”?
  - Switch to the next router and repeat these steps

Netlab Mondovì

NOTE
*: Interfaccia switched (richiede la configurazione delle VLAN)
**: interfaccia lato DCE (richiede la configurazione del clockrate)

LAN PC interna (Laboratorio)
Vlan 888

IP: 192.168.0.100
DG: -
NIC: 3COM #2

Interfaccia di sniffing
(No IP address)
NIC: Broadcom

labreti-mondovi.ipv6.polito.it
IP: 130.192.71.203
DG: 130.192.71.17
NIC: 3COM #1

IP: 192.168.100.1
DG: -
NIC: 3COM #3

Internet
Vlan 777

Rete router
Vlan 999

Vlan 10

Fe0
Fe2*
Fe1*
R1

Vlan 12
Vlan 13

Fe2*
Fe1*
R2
Fe0

Fe2*
Fe1*
R3
Fe0

Vlan 23

Fe4*
labreti-mondovi-router.ipv6.polito.it
IP: 130.192.71.204
DG: 130.192.71.17

Fe0
Fe2*
Fe1*
R4

Vlan 45
Vlan 46

Fe2*
Fe1*
R5
Fe0

Vlan 56

Fe2*
Fe1*
R6
Fe0

Vlan 50
Vlan 60

Fe0
Fe2*
Fe1*
R7

Vlan 78
Vlan 79

E0
S0
R8
Fe0

S0**
E0
R9
Fe0

Vlan 80
Vlan 90

Netlab Torino

NOTE
*: Interfaccia switched (richiede la configurazione delle VLAN)

LAN PC interna (Laboratorio)
Vlan 888

IP: 192.168.0.100
DG: -
NIC: 3COM #2

Interfaccia di sniffing
(No IP address)
NIC: Intel Pro/1000

labreti-torino.ipv6.polito.it
IP: 130.192.86.10
DG: 10.0.0.2 (??)
NIC: Broadcom Nextreme

IP: 192.168.100.1
DG: -
NIC: Intel Pro/1000

Internet
Vlan 777

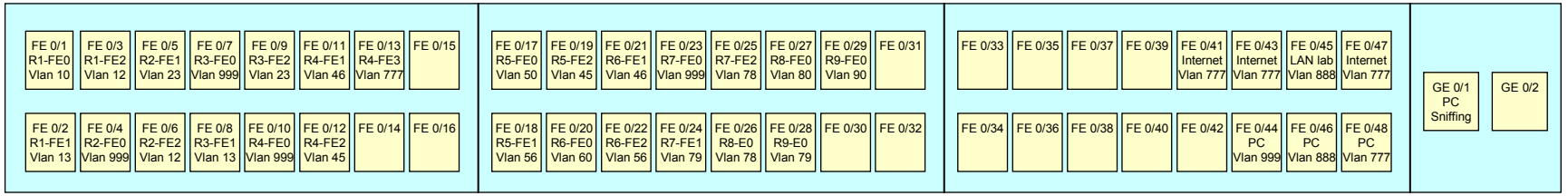
Rete router
Vlan 999

Vlan 10
Fe0*
Fe2*
Fe1*
R1
Vlan 12
Vlan 13
Fe2*
Fe1*
R2
Fe2*
Fe1*
R3
Fe0*
Fe0*
Vlan 23

Fe4* (??)
labreti-torino-router.ipv6.polito.it
IP: 130.192.71.204 (??)
DG: 130.192.71.17 (??)
Fe0*
Fe2*
Fe1*
R4
Vlan 45
Vlan 46
Fe2*
Fe1*
R5
Fe1*
Fe2*
R6
Vlan 56
Fe0*
Fe0*
Vlan 50
Vlan 60

Fe0*
Fe2*
Fe1*
R7
Vlan 78
Vlan 79
Fe2*
Fe1*
R8
Fe1*
Fe2*
R9
Fe0*
Fe0*
Vlan 80
Vlan 90

Physical topology


FE 0/1 R1-FE0 Vlan 10
FE 0/3 R1-FE2 Vlan 12
FE 0/5 R2-FE1 Vlan 23
FE 0/7 R3-FE0 Vlan 999
FE 0/9 R3-FE2 Vlan 23
FE 0/11 R4-FE1 Vlan 46
FE 0/13 R4-FE3 Vlan 777
FE 0/15
FE 0/2 R1-FE1 Vlan 13
FE 0/4 R2-FE0 Vlan 999
FE 0/6 R2-FE2 Vlan 12
FE 0/8 R3-FE1 Vlan 13
FE 0/10 R4-FE0 Vlan 999
FE 0/12 R4-FE2 Vlan 45
FE 0/14
FE 0/16
FE 0/17 R5-FE0 Vlan 50
FE 0/19 R5-FE2 Vlan 45
FE 0/21 R6-FE1 Vlan 46
FE 0/23 R7-FE0 Vlan 999
FE 0/25 R7-FE2 Vlan 78
FE 0/27 R8-FE0 Vlan 80
FE 0/29 R9-FE0 Vlan 90
FE 0/31
FE 0/18 R5-FE1 Vlan 56
FE 0/20 R6-FE0 Vlan 60
FE 0/22 R6-FE2 Vlan 56
FE 0/24 R7-FE1 Vlan 79
FE 0/26 R8-E0 Vlan 78
FE 0/28 R9-E0 Vlan 79
FE 0/30
FE 0/32
FE 0/33
FE 0/35
FE 0/37
FE 0/39
FE 0/41 Internet Vlan 777
FE 0/43 Internet Vlan 777
FE 0/45 LAN lab Vlan 888
FE 0/47 Internet Vlan 777
FE 0/34
FE 0/36
FE 0/38
FE 0/40
FE 0/42
FE 0/44 PC Vlan 999
FE 0/46 PC Vlan 888
FE 0/48 PC Vlan 777
GE 0/1 PC Sniffing
GE 0/2

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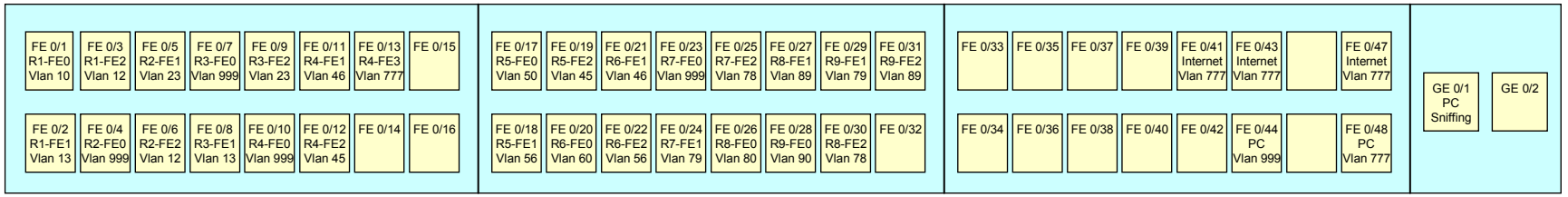
FE 0/1 R1-FE0 Vlan 10
FE 0/3 R1-FE2 Vlan 12
FE 0/5 R2-FE1 Vlan 23
FE 0/7 R3-FE0 Vlan 999
FE 0/9 R3-FE2 Vlan 23
FE 0/11 R4-FE1 Vlan 46
FE 0/13 R4-FE3 Vlan 777
FE 0/15
FE 0/2 R1-FE1 Vlan 13
FE 0/4 R2-FE0 Vlan 999
FE 0/6 R2-FE2 Vlan 12
FE 0/8 R3-FE1 Vlan 13
FE 0/10 R4-FE0 Vlan 999
FE 0/12 R4-FE2 Vlan 45
FE 0/14
FE 0/16
FE 0/17 R5-FE0 Vlan 50
FE 0/19 R5-FE2 Vlan 45
FE 0/21 R6-FE1 Vlan 46
FE 0/23 R7-FE0 Vlan 999
FE 0/25 R7-FE2 Vlan 78
FE 0/27 R8-FE1 Vlan 89
FE 0/29 R9-FE1 Vlan 79
FE 0/31 R9-FE2 Vlan 89
FE 0/18 R5-FE1 Vlan 56
FE 0/20 R6-FE0 Vlan 60
FE 0/22 R6-FE2 Vlan 56
FE 0/24 R7-FE1 Vlan 79
FE 0/26 R8-FE0 Vlan 80
FE 0/28 R9-FE0 Vlan 90
FE 0/30 R8-FE2 Vlan 78
FE 0/32
FE 0/33
FE 0/35
FE 0/37
FE 0/39
FE 0/41 Internet Vlan 777
FE 0/43 Internet Vlan 777
FE 0/47 Internet Vlan 777
FE 0/34
FE 0/36
FE 0/38
FE 0/40
FE 0/42
FE 0/44 PC Vlan 999
FE 0/48 PC Vlan 777
GE 0/1 PC Sniffing
GE 0/2

Cisco Catalyst 2950T-48 SI - Torino